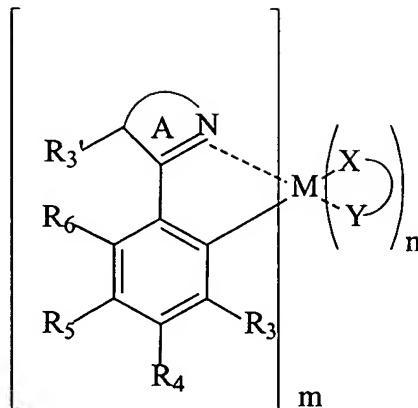


WHAT IS CLAIMED IS:

1. A compound having the structure:



wherein

M is a metal having an atomic weight greater than 40;

R_3' is a substituent selected from the group consisting of alkyl, heteroalkyl, aryl, heteroaryl, and aralkyl, wherein R_3' is optionally substituted by one or more substituents Z;

R_5 is a substituent selected from the group consisting of aryl and heteroaryl, wherein said aryl or heteroaryl is unsubstituted or optionally, substituted with one or more non-aromatic groups;

ring A is an aromatic heterocyclic or a fused aromatic heterocyclic ring with at least one nitrogen atom that is coordinated to the metal M, wherein the ring A can be optionally substituted with one or more substituents Z;

R_3 is a substituent selected from the group consisting of H, alkyl, alkenyl, alkynyl, alkylaryl, CN, CF_3 , C_nF_{2n+1} , trifluorovinyl, CO_2R , $C(O)R$, NR_2 , NO_2 , OR, halo, aryl, heteroaryl, substituted aryl, substituted heteroaryl or a heterocyclic group;

R_4 is a substituent selected from the group consisting of H, alkyl, alkenyl, alkynyl, alkylaryl, CN, CF_3 , C_nF_{2n+1} , trifluorovinyl, CO_2R , $C(O)R$, NR_2 , NO_2 , OR, halo, aryl, heteroaryl, substituted aryl, substituted heteroaryl or a heterocyclic group;

additionally or alternatively, R_3 and R_4 , together form independently a fused 4 to 7-member cyclic group, wherein said cyclic group is cycloalkyl, cycloheteroalkyl, aryl, or heteroaryl; and wherein said cyclic group is optionally substituted by one or more substituents Z;

R_6 is a substituent selected from the group consisting of H, alkyl, alkenyl, alkynyl, alkylaryl, CN, CF_3 , C_nF_{2n+1} , trifluorovinyl, CO_2R , $C(O)R$, NR_2 , NO_2 , OR, halo, aryl, heteroaryl, substituted aryl, substituted heteroaryl or a heterocyclic group;

alternatively, R_3' and R_6 may be bridged by a group selected from $-CR_2-CR_2-$, $-CR=CR-$, $-CR_2-$, $-O-$, $-NR-$, $-O-CR_2-$, $-NR-CR_2-$, and $-N=CR-$;

each R is independently H, alkyl, alkenyl, alkynyl, heteroalkyl, aryl, heteroaryl, or aralkyl; wherein R is optionally substituted by one or more substituents Z;

each Z is independently a halogen, R' , $O-R'$, $N(R')_2$, SR' , $C(O)R'$, $C(O)OR'$, $C(O)N(R')_2$, CN, NO_2 , SO_2 , SOR' , SO_2R' , or SO_3R' ;

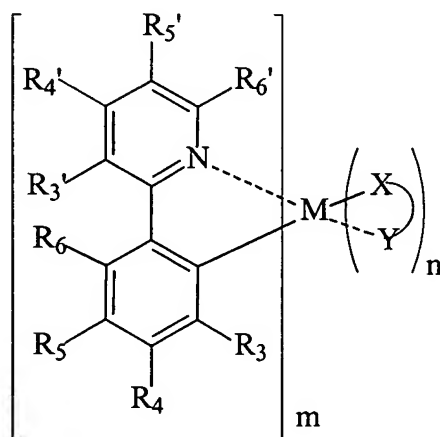
Each R' is independently H, alkyl, perhaloalkyl, alkenyl, alkynyl, heteroalkyl, aryl, or heteroaryl;

(X-Y) is an ancillary ligand;

m is a value from 1 to the maximum number of ligands that may be attached to the metal;

and $m + n$ is the maximum number of ligands that may be attached to the metal.

2. The compound of claim 1, having the structure:



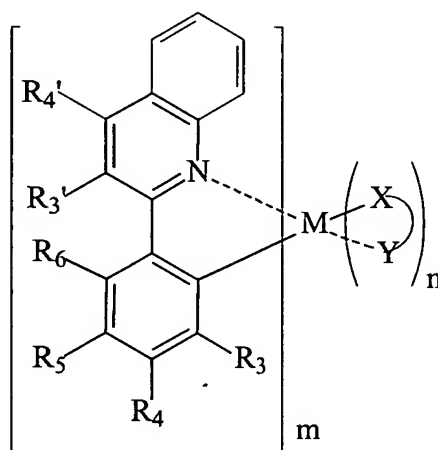
wherein

R_4' , R_5' , and R_6' are each independently H, alkyl, alkenyl, alkynyl, heteroalkyl, alkenyl, alkynyl, heteroalkyl, aryl, heteroaryl, aralkyl; and wherein R_4' , R_5' , and R_6' are optionally substituted by one or more substituents Z; and

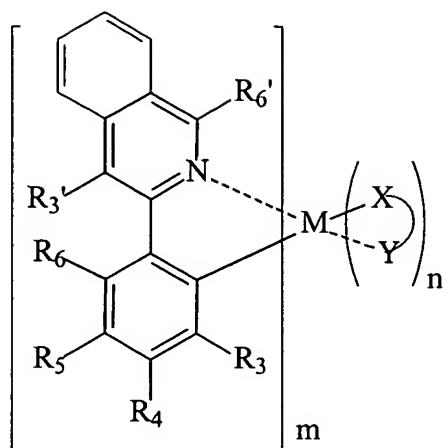
additionally or alternatively, any one or more of R_4' and R_5' , or R_5' and R_6' , or R_3 and R_4 , together form independently a fused 4- to 7-member cyclic group, wherein said cyclic group is cycloalkyl, cycloheteroalkyl, aryl, or heteroaryl; and wherein said cyclic group is optionally substituted by one or more substituent Z;

additionally or alternatively, R_3' and R_6 are linked by a group having the formula: $-CR_2-$, $-CR=CR-$, $-CR_2-$, $-O-$, $-NR-$, $-O-CR_2-$, $-NR-CR_2-$, $-N=CR-$ wherein R is selected from the group consisting of H, alkyl, aryl, and aralkyl.

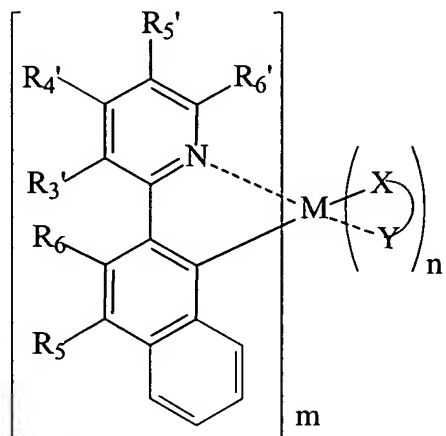
3. The compound of claim 2, having the structure:



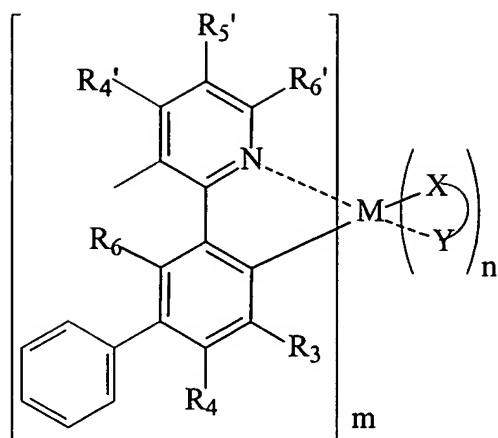
4. The compound of claim 2, having the structure:



5. The compound of claim 2, having the structure:

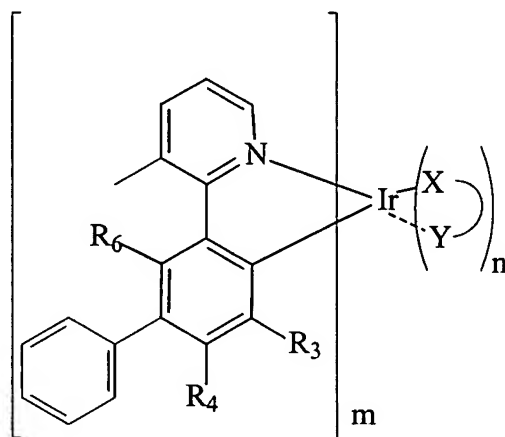


6. The compound of claim 2, wherein *R*₅ is substituted or unsubstituted phenyl, naphthyl or pyridyl.
7. The compound of claim 6, wherein *R*₅ is a phenyl.
8. The compound of claim 6, wherein *R*₃' is a methyl group.
9. The compound of claim 2, having the structure:

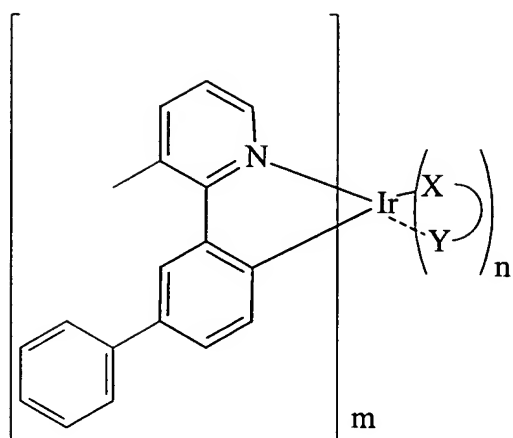


wherein R_5' and R_6' are H, and additionally or alternatively, together form a fused 4- to 7-member cyclic group, wherein said cyclic group is cycloalkyl, cycloheteroalkyl, aryl, or heteroaryl.

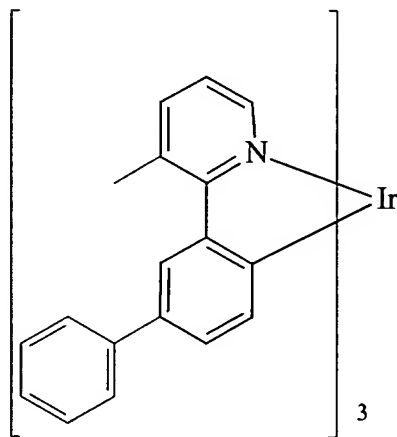
10. The compound of claim 9, wherein M is selected from the group consisting of Ir, Pt, Pd, Rh, Re, Ru, Os, Tl, Pb, Bi, In, Sn, Sb, Te, Au, and Ag.
11. The compound of claim 10, wherein M is Ir.
12. The compound of claim 11, having the structure:



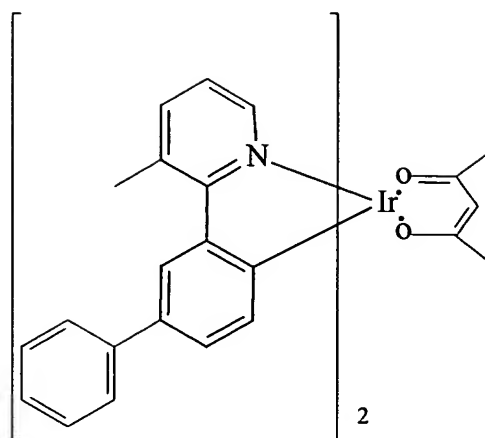
13. The compound of claim 12, having the structure:



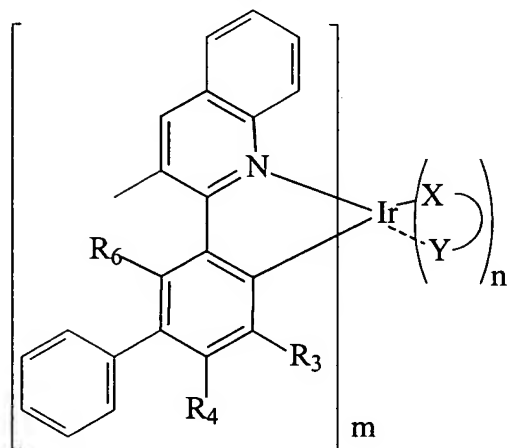
14. The compound of claim 13, wherein m is 3 and n is zero, such that the compound has the structure:



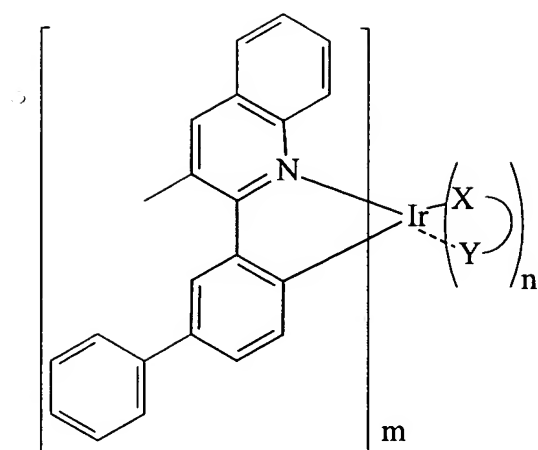
15. The compound of claim 13, wherein m is 2 and n is 1.
16. The compound of claim 15, having the structure:



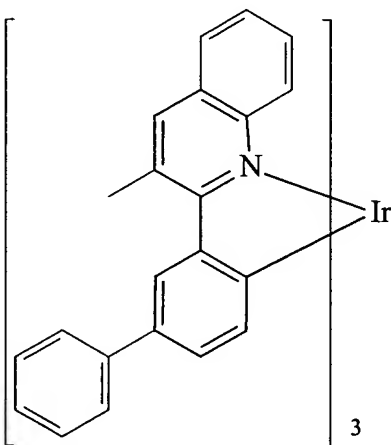
17. The compound of claim 11, having the structure:



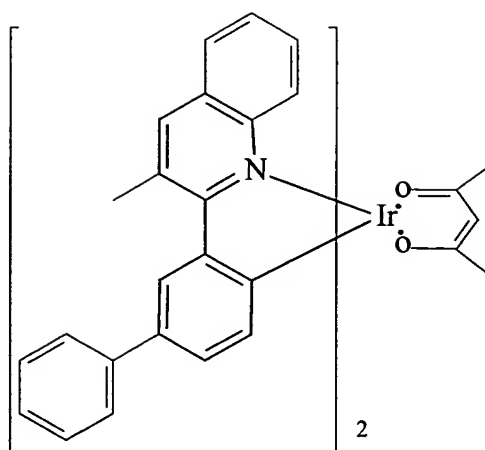
18. The compound of claim 17, having the structure:



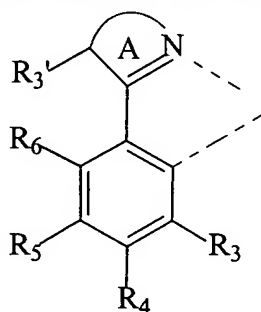
19. The compound of claim 18, wherein m is 3 and n is zero, such that the compound has the structure:



20. The compound of claim 18, wherein m is 2 and n is 1.
21. The compound of claim 20, having the structure:



22. A compound comprising a ligand having the structure:



wherein

M is a metal having an atomic weight greater than 40;

R₃' is a substituent selected from the group consisting of alkyl, heteroalkyl, aryl, heteroaryl, and aralkyl, wherein R₃' is optionally substituted by one or more substituents Z;

R₅ is a substituent selected from the group consisting of aryl and heteroaryl, wherein said aryl or heteroaryl is unsubstituted or optionally, substituted with one or more non-aromatic groups;

ring A is an aromatic heterocyclic or a fused aromatic heterocyclic ring with at least one nitrogen atom that is coordinated to the metal M, wherein the ring A can be optionally substituted with one or more substituents Z;

R_3 is a substituent selected from the group consisting of H, alkyl, alkenyl, alkynyl, alkylaryl, CN, CF_3 , C_nF_{2n+1} , trifluorovinyl, CO_2R , $C(O)R$, NR_2 , NO_2 , OR, halo, aryl, heteroaryl, substituted aryl, substituted heteroaryl or a heterocyclic group;

R_4 is a substituent selected from the group consisting of H, alkyl, alkenyl, alkynyl, alkylaryl, CN, CF_3 , C_nF_{2n+1} , trifluorovinyl, CO_2R , $C(O)R$, NR_2 , NO_2 , OR, halo, aryl, heteroaryl, substituted aryl, substituted heteroaryl or a heterocyclic group;

additionally or alternatively, R_3 and R_4 , together form independently a fused 4 to 7-member cyclic group, wherein said cyclic group is cycloalkyl, cycloheteroalkyl, aryl, or heteroaryl; and wherein said cyclic group is optionally substituted by one or more substituents Z;

R_6 is a substituent selected from the group consisting of H, alkyl, alkenyl, alkynyl, alkylaryl, CN, CF_3 , C_nF_{2n+1} , trifluorovinyl, CO_2R , $C(O)R$, NR_2 , NO_2 , OR, halo, aryl, heteroaryl, substituted aryl, substituted heteroaryl or a heterocyclic group;

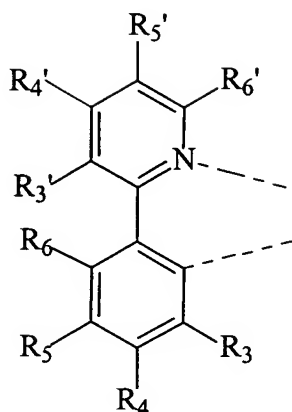
alternatively, R_3' and R_6 may be bridged by a group selected from $-CR_2-CR_2-$, $-CR=CR-$, $-CR_2-$, $-O-$, $-NR-$, $-O-CR_2-$, $-NR-CR_2-$, and $-N=CR-$;

each R is independently H, alkyl, alkenyl, alkynyl, heteroalkyl, aryl, heteroaryl, or aralkyl; wherein R is optionally substituted by one or more substituents Z;

each Z is independently a halogen, R' , $O-R'$, $N(R')_2$, SR' , $C(O)R'$, $C(O)OR'$, $C(O)N(R')_2$, CN, NO_2 , SO_2 , SOR' , SO_2R' , or SO_3R' ;

each R' is independently H, alkyl, perhaloalkyl, alkenyl, alkynyl, heteroalkyl, aryl, or heteroaryl.

23. The compound of claim 22, wherein the ligand has the structure



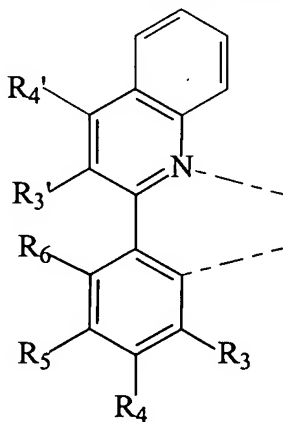
wherein

R_4' , R_5' , and R_6' are each independently H, alkyl, alkenyl, alkynyl, heteroalkyl, alkenyl, alkynyl, heteroalkyl, aryl, heteroaryl, aralkyl; and wherein R_4' , R_5' , and R_6' are optionally substituted by one or more substituents Z; and

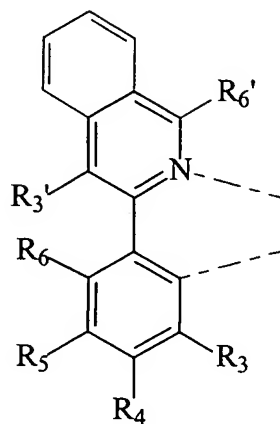
additionally or alternatively, any one or more of R_4' and R_5' , or R_5' and R_6' , or R_3 and R_4 , together form independently a fused 4- to 7-member cyclic group, wherein said cyclic group is cycloalkyl, cycloheteroalkyl, aryl, or heteroaryl; and wherein said cyclic group is optionally substituted by one or more substituent Z;

additionally or alternatively, R_3' and R_6 are linked by a group having the formula: $-CR_2-CR_2-$, $-CR=CR-$, $-CR_2-$, $-O-$, $-NR-$, $-O-CR_2-$, $-NR-CR_2-$, $-N=CR-$ wherein R is selected from the group consisting of H, alkyl, aryl, and aralkyl.

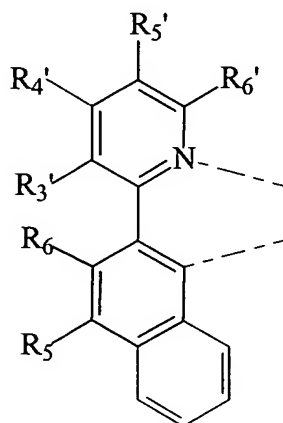
24. The compound of claim 23, wherein the ligand has the structure:



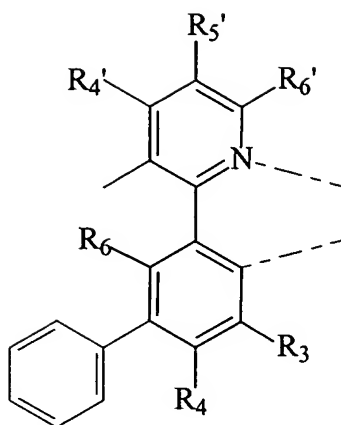
25. The compound of claim 23, wherein the ligand has the structure:



26. The compound of claim 23, wherein the ligand has the structure:

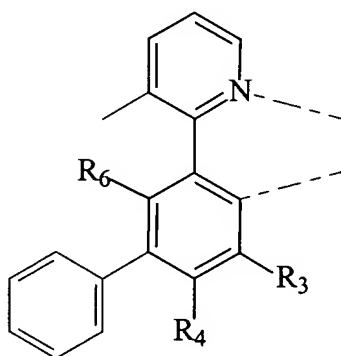


27. The compound of claim 23, wherein R₅ is substituted or unsubstituted phenyl, naphthyl or pyridyl.
28. The compound of claim 27, wherein R₅ is a phenyl.
29. The compound of claim 27, wherein R₃ is a methyl group.
30. The compound of claim 23, wherein the ligand has the structure:

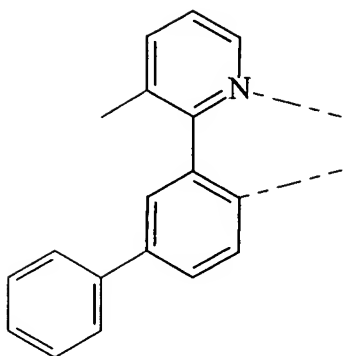


wherein R_5' and R_6' are H, and additionally or alternatively, together form a fused 4- to 7-member cyclic group, wherein said cyclic group is cycloalkyl, cycloheteroalkyl, aryl, or heteroaryl.

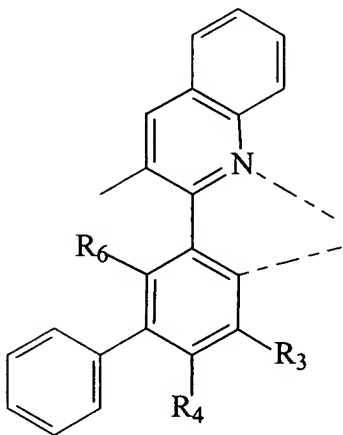
31. The compound of claim 30, wherein the ligand has the structure:



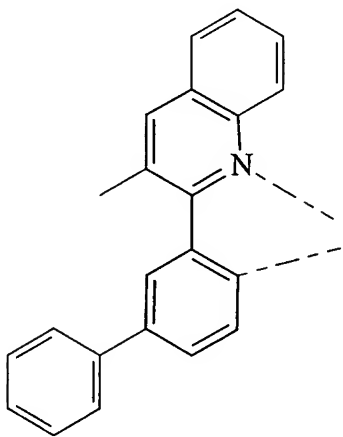
32. The compound of claim 31, wherein the ligand has the structure:



33. The compound of claim 30, wherein the ligand has the structure:

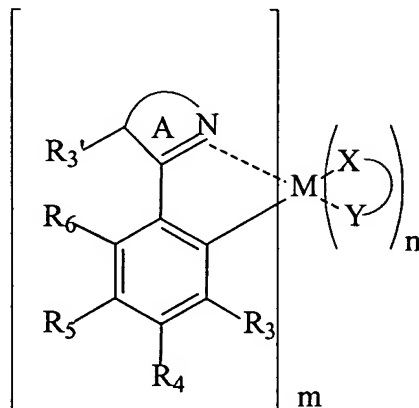


34. The compound of claim 33, wherein the ligand has the structure:



35. An organic light emitting device, comprising:

- (a) an anode;
- (b) a cathode; and
- (c) an emissive layer disposed between the anode and the cathode, the emissive layer further comprising an emissive material having the structure:



wherein

M is a metal having an atomic weight greater than 40;

R₃' is a substituent selected from the group consisting of alkyl, heteroalkyl, aryl, heteroaryl, and aralkyl, wherein R₃' is optionally substituted by one or more substituents Z;

R₅ is a substituent selected from the group consisting of aryl and heteroaryl, wherein said aryl or heteroaryl is unsubstituted or optionally, substituted with one or more non-aromatic groups;

ring A is an aromatic heterocyclic or a fused aromatic heterocyclic ring with at least one nitrogen atom that is coordinated to the metal M, wherein the ring A can be optionally substituted with one or more non-aromatic groups;

R₃ is a substituent selected from the group consisting of H, alkyl, alkenyl, alkynyl, alkylaryl, CN, CF₃, C_nF_{2n+1}, trifluorovinyl, CO₂R, C(O)R, NR₂, NO₂, OR, halo, aryl, heteroaryl, substituted aryl, substituted heteroaryl or a heterocyclic group;

R_4 is a substituent selected from the group consisting of H, alkyl, alkenyl, alkynyl, alkylaryl, CN, CF_3 , C_nF_{2n+1} , trifluorovinyl, CO_2R , $C(O)R$, NR_2 , NO_2 , OR, halo, aryl, heteroaryl, substituted aryl, substituted heteroaryl or a heterocyclic group;

additionally or alternatively, R_3 and R_4 , together from independently a fused 4 to 7-member cyclic group, wherein said cyclic group is cycloalkyl, cycloheteroalkyl, aryl, or heteroaryl; and wherein said cyclic group is optionally substituted by one or more substituents Z;

R_6 is a substituent selected from the group consisting of H, alkyl, alkenyl, alkynyl, alkylaryl, CN, CF_3 , C_nF_{2n+1} , trifluorovinyl, CO_2R , $C(O)R$, NR_2 , NO_2 , OR, halo, aryl, heteroaryl, substituted aryl, substituted heteroaryl or a heterocyclic group;

alternatively, R_3' and R_6 may be bridged by a group selected from $-CR_2-CR_2-$, $-CR=CR-$, $-CR_2-$, $-O-$, $-NR-$, $-O-CR_2-$, $-NR-CR_2-$, and $-N=CR-$;

each R is independently H, alkyl, alkenyl, alkynyl, heteroalkyl, aryl, heteroaryl, or aralkyl; wherein R is optionally substituted by one or more substituents Z;

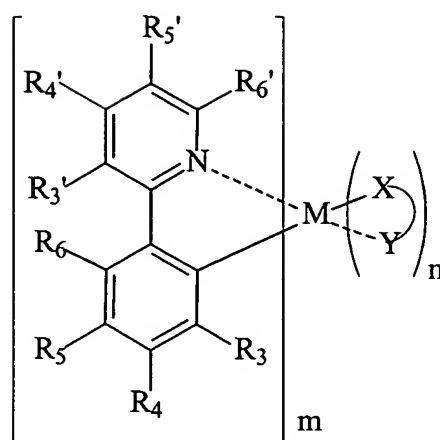
each Z is independently a halogen, R' , $O-R'$, $N(R')_2$, SR' , $C(O)R'$, $C(O)OR'$, $C(O)N(R')_2$, CN, NO_2 , SO_2 , SOR' , SO_2R' , or SO_3R' ;

Each R' is independently H, alkyl, perhaloalkyl, alkenyl, alkynyl, heteroalkyl, aryl, or heteroaryl;

(X-Y) is an ancillary ligand;

m is a value from 1 to the maximum number of ligands that may be attached to the metal; and m + n is the maximum number of ligands that may be attached to the metal.

36. The device of claim 35, wherein the compound has the structure:



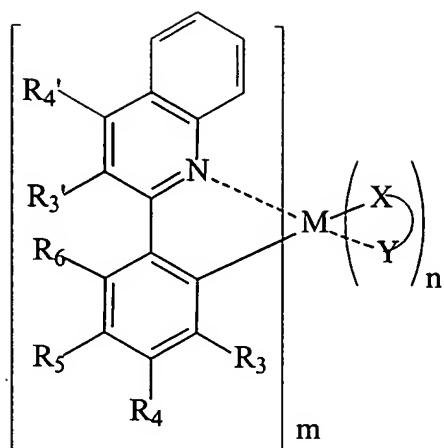
wherein

R_4' , R_5' , and R_6' are each independently H, alkyl, alkenyl, alkynyl, heteroalkyl, alkenyl, alkynyl, heteroalkyl, aryl, heteroaryl, aralkyl; and wherein R_4' , R_5' , and R_6' are optionally substituted by one or more substituents Z; and

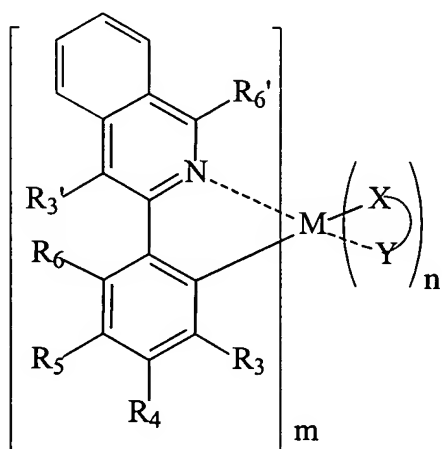
additionally or alternatively, any one or more of R_4' and R_5' , or R_5' and R_6' , or R_3 and R_4 , together form independently a fused 4- to 7-member cyclic group, wherein said cyclic group is cycloalkyl, cycloheteroalkyl, aryl, or heteroaryl; and wherein said cyclic group is optionally substituted by one or more substituent Z;

additionally or alternatively, R_3' and R_6 are linked by a group having the formula: $-CR_2-$, CR_2- , $-CR=CR-$, $-CR_2-$, $-O-$, $-NR-$, $-O-CR_2-$, $-NR-CR_2-$, $-N=CR-$ wherein R is selected from the group consisting of H, alkyl, aryl, and aralkyl.

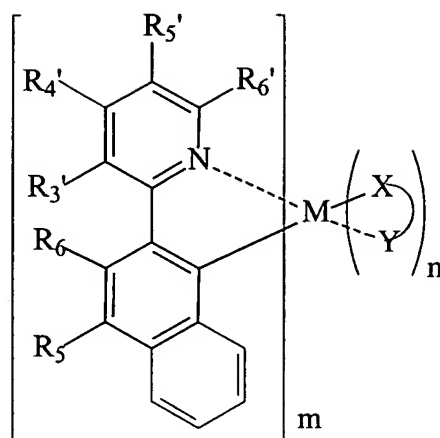
37. The device of claim 36, wherein the compound has the structure:



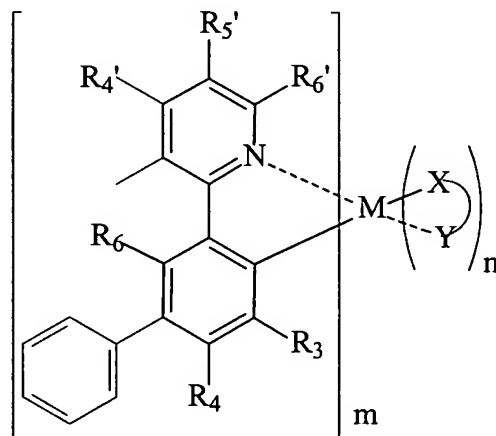
38. The device of claim 36, wherein the compound has the structure:



39. The device material of claim 36, wherein the compound has the structure:

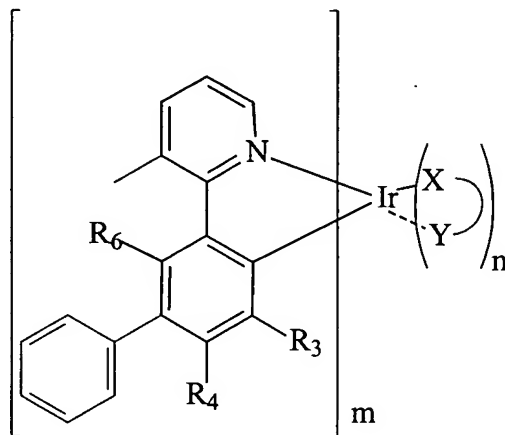


40. The device of claim 36, wherein R_5 is substituted or unsubstituted phenyl, naphthyl or pyridyl.
41. The device of claim 40, wherein R_5 is a phenyl.
42. The device of claim 40, wherein R'_3 is a methyl group.
43. The device of claim 36, wherein the compound has the structure:

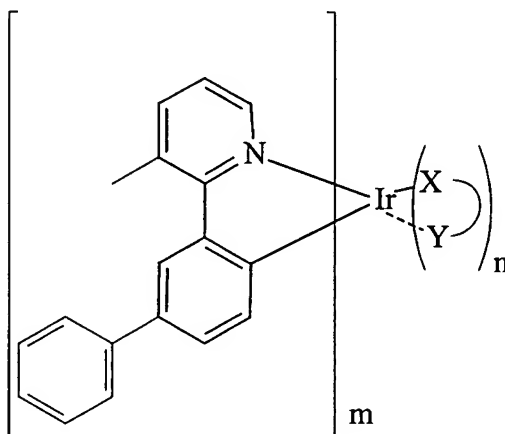


wherein R_5' and R_6' are H, and additionally or alternatively, together form a fused 4- to 7-member cyclic group, wherein said cyclic group is cycloalkyl, cycloheteroalkyl, aryl, or heteroaryl.

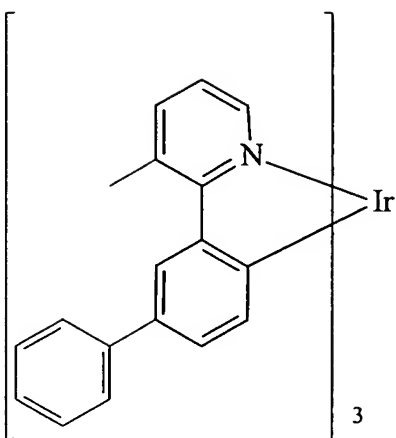
44. The device of claim 43, wherein M is selected from the group consisting of Ir, Pt, Pd, Rh, Re, Ru, Os, Tl, Pb, Bi, In, Sn, Sb, Te, Au, and Ag.
45. The device of claim 44, wherein M is Ir.
46. The device of claim 45, wherein the compound has the structure:



47. The device of claim 46, wherein the compound has the structure:

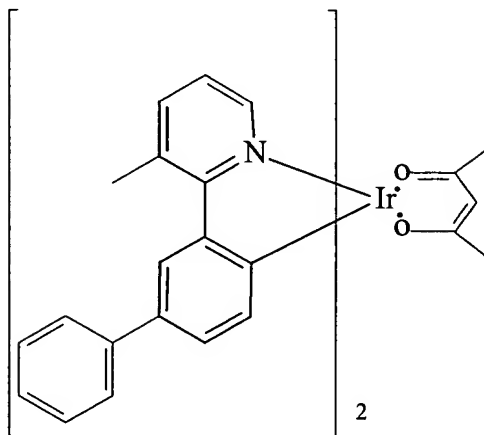


48. The device of claim 47, wherein m is 3 and n is zero, such that the compound has the structure:

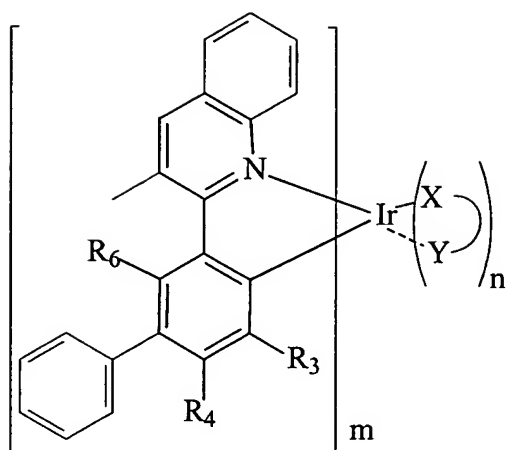


49. The device of claim 47, wherein m is 2 and n is 1.

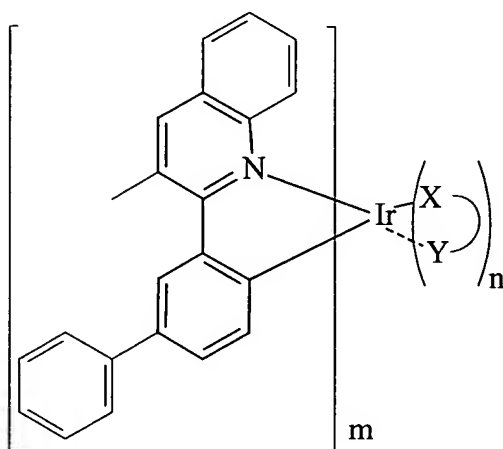
50. The device of claim 49, having the structure:



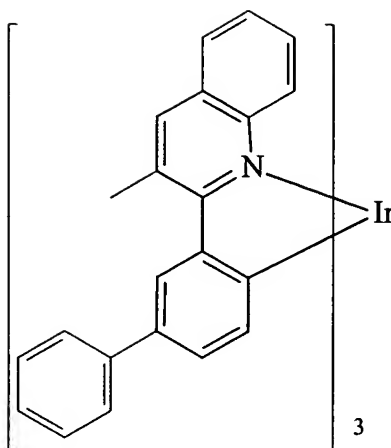
51. The device of claim 45, having the structure:



52. The device of claim 51, wherein the compound has the structure:

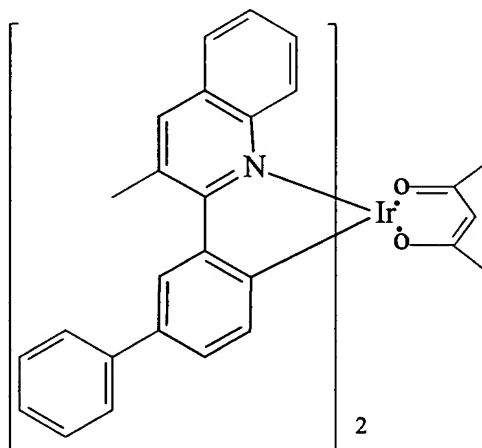


53. The device of claim 52, wherein m is 3 and n is zero, such that the compound has the structure:



54. The device of claim 52, wherein m is 2 and n is 1.

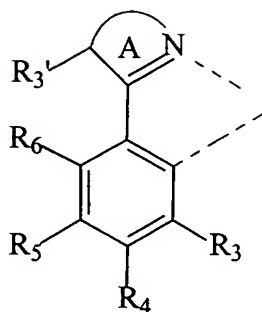
55. The device of claim 54, having the structure:



56. The device of claim 35, wherein the device is incorporated into a consumer product.

57. An organic light emitting device, comprising:

- (d) an anode;
- (e) a cathode; and
- (f) an emissive layer disposed between the anode and the cathode, the emissive layer further comprising an emissive material having a ligand with the structure:



wherein

M is a metal having an atomic weight greater than 40;

R_3' is a substituent selected from the group consisting of alkyl, heteroalkyl, aryl, heteroaryl, and aralkyl, wherein R_3' is optionally substituted by one or more substituents Z;

R_5 is a substituent selected from the group consisting of aryl and heteroaryl, wherein said aryl or heteroaryl is unsubstituted or optionally, substituted with one or more non-aromatic groups;

ring A is an aromatic heterocyclic or a fused aromatic heterocyclic ring with at least one nitrogen atom that is coordinated to the metal M, wherein the ring A can be optionally substituted with one or more substituents Z;

R_3 is a substituent selected from the group consisting of H, alkyl, alkenyl, alkynyl, alkylaryl, CN, CF_3 , C_nF_{2n+1} , trifluorovinyl, CO_2R , $C(O)R$, NR_2 , NO_2 , OR, halo, aryl, heteroaryl, substituted aryl, substituted heteroaryl or a heterocyclic group;

R_4 is a substituent selected from the group consisting of H, alkyl, alkenyl, alkynyl, alkylaryl, CN, CF_3 , C_nF_{2n+1} , trifluorovinyl, CO_2R , $C(O)R$, NR_2 , NO_2 , OR, halo, aryl, heteroaryl, substituted aryl, substituted heteroaryl or a heterocyclic group;

additionally or alternatively, R_3 and R_4 , together form independently a fused 4 to 7-member cyclic group, wherein said cyclic group is cycloalkyl, cycloheteroalkyl, aryl, or heteroaryl; and wherein said cyclic group is optionally substituted by one or more substituents Z;

R_6 is a substituent selected from the group consisting of H, alkyl, alkenyl, alkynyl, alkylaryl, CN, CF_3 , C_nF_{2n+1} , trifluorovinyl, CO_2R , $C(O)R$, NR_2 , NO_2 , OR, halo, aryl, heteroaryl, substituted aryl, substituted heteroaryl or a heterocyclic group;

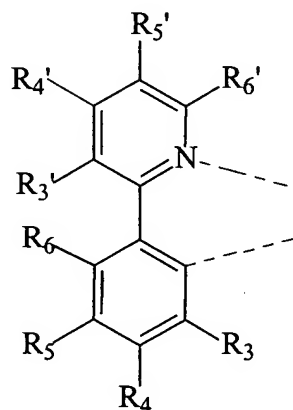
alternatively, R_3' and R_6 may be bridged by a group selected from $-CR_2-CR_2-$, $-CR=CR-$, $-CR_2-$, $-O-$, $-NR-$, $-O-CR_2-$, $-NR-CR_2-$, and $-N=CR-$;

each R is independently H, alkyl, alkenyl, alkynyl, heteroalkyl, aryl, heteroaryl, or aralkyl; wherein R is optionally substituted by one or more substituents Z;

each Z is independently a halogen, R' , $O-R'$, $N(R')_2$, SR' , $C(O)R'$, $C(O)OR'$, $C(O)N(R')_2$, CN, NO_2 , SO_2 , SOR' , SO_2R' , or SO_3R' ;

each R' is independently H, alkyl, perhaloalkyl, alkenyl, alkynyl, heteroalkyl, aryl, or heteroaryl.

58. The device of claim 57, wherein the ligand has the structure



wherein

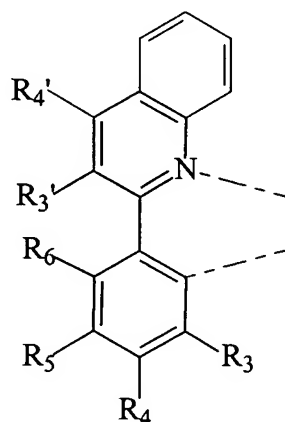
R_4' , R_5' , and R_6' are each independently H, alkyl, alkenyl, alkynyl, heteroalkyl, alkenyl, alkynyl, heteroalkyl, aryl, heteroaryl, aralkyl; and wherein R_4' , R_5' , and R_6' are optionally substituted by one or more substituents Z; and

additionally or alternatively, any one or more of R_4' and R_5' , or R_5' and R_6' , or R_3 and R_4 , together form independently a fused 4- to 7-member cyclic group, wherein said cyclic group is

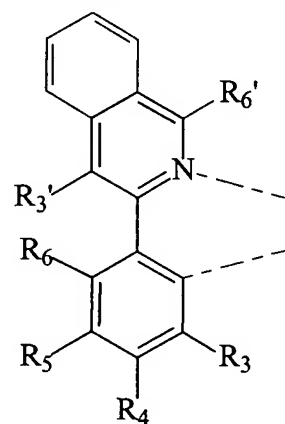
cycloalkyl, cycloheteroalkyl, aryl, or heteroaryl; and wherein said cyclic group is optionally substituted by one or more substituent Z;

additionally or alternatively, R_3' and R_6 are linked by a group having the formula: $-\text{CR}_2-$, CR_2- , $-\text{CR}=\text{CR}-$, $-\text{CR}_2-$, $-\text{O}-$, $-\text{NR}-$, $-\text{O}-\text{CR}_2-$, $-\text{NR}-\text{CR}_2-$, $-\text{N}=\text{CR}-$ wherein R is selected from the group consisting of H, alkyl, aryl, and aralkyl.

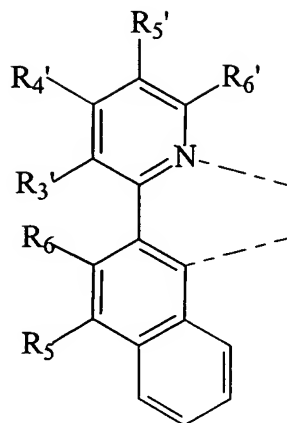
59. The device of claim 58, wherein the ligand has the structure:



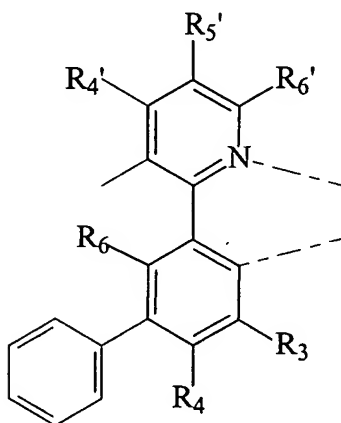
60. The device of claim 58, wherein the ligand has the structure:



61. The device of claim 58, wherein the ligand has the structure:

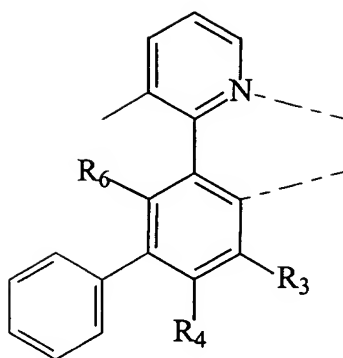


62. The device of claim 58, wherein R_5 is substituted or unsubstituted phenyl, naphthyl or pyridyl.
63. The device of claim 62, wherein R_5 is a phenyl.
64. The device of claim 62, wherein R'_3 is a methyl group.
65. The device of claim 58, wherein the ligand has the structure:

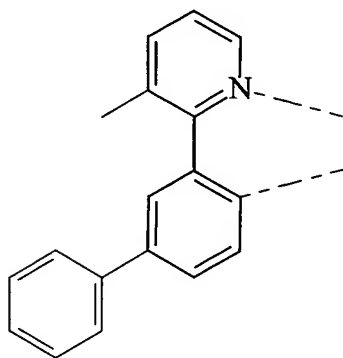


wherein R_5' and R_6' are H, and additionally or alternatively, together form a fused 4- to 7-member cyclic group, wherein said cyclic group is cycloalkyl, cycloheteroalkyl, aryl, or heteroaryl.

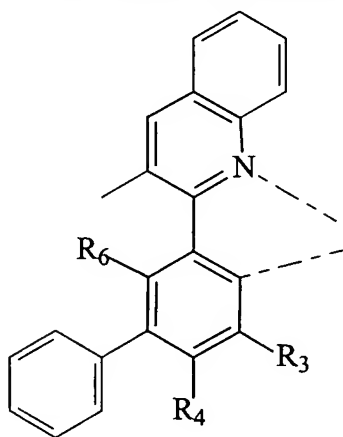
66. The device of claim 65, wherein the ligand has the structure:



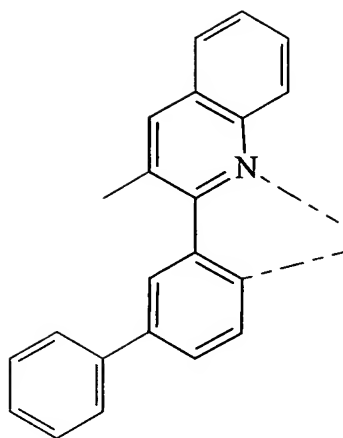
67. The device of claim 66, wherein the ligand has the structure:



68. The device of claim 65, wherein the ligand has the structure:



69. The device of claim 68, wherein the ligand has the structure:



70. The device of claim 57, wherein the device is incorporated into a consumer product.